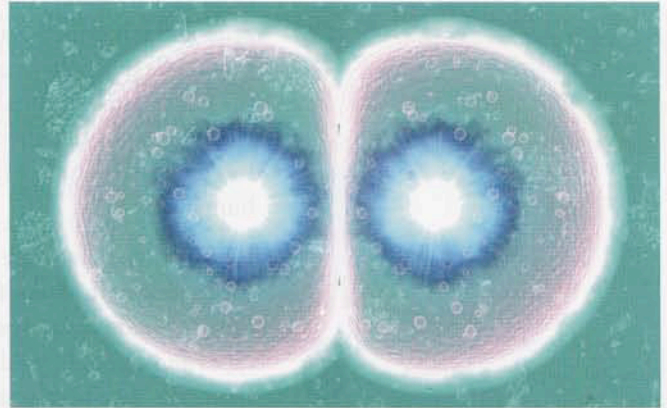


Cell reproduction and differentiation

One of the functions that many cells retain is the ability to reproduce themselves. In multicellular organisms, this allows the possibility of growth. It also allows for the replacement of damaged or dead cells.

Multicellular organisms like ourselves usually start out as a single cell after some type of sexual reproduction. This single cell has the ability to reproduce at a very rapid rate, and the resulting cells then go through a differentiation process to produce all the required cell types that are necessary for the well-being of the organism. The number of different cell types from the one original cell may indeed be staggering. This differentiation process is the result of the expression of certain specific genes but not others. Genes, segments of DNA on a chromosome, allow for the production of all the different cells in the organism. Therefore, each cell contains all the genetic information for the production of the complete organism. However, each cell becomes a specific type of cell dependent on which DNA segment becomes active.

Some cells have a greatly, or even completely, diminished ability to reproduce once they become specialized. Nerve and muscle cells are prime examples of this type of cell. Other cells, such as epithelial cells like skin, retain the ability to rapidly reproduce throughout their life. The offspring of these rapidly reproducing cells then differentiate into the same cell type as the parent.



▲ This is a computer artwork of an egg cell fertilized during in vitro fertilization and now undergoing the first cell division.

Stem cells

There are populations of cells within organisms that retain their ability to divide and differentiate into various cell types. These cells are called stem cells.

Plants contain such cells in regions of meristematic tissue. Meristematic areas occur near root and stem tips and are composed of rapidly reproducing cells that produce new cells capable of becoming various types of tissue within the root or stem. Gardeners take advantage of these cells when they take cuttings from stems or roots and use them to produce new plants.

In the early 1980s, scientists found pluripotent or embryonic stem cells in mice. These stem cells retain the ability to form any type of cell in an organism and can even form a complete organism.

When stem cells divide to form a specific type of tissue, they also produce some cells that remain as stem cells. This allows for the continual production of a particular type of tissue. Medical experts immediately noted the possibilities of such cells in treating certain human diseases. But a problem discovered early in the research was that stem cells cannot be distinguished by their appearance. They can only be isolated from other cells on the basis of their behaviour.

Stem cell research and treatments

Some of the most promising research recently has been directed towards growing large numbers of embryonic stem cells in culture so that they could be used to